# APPARATUS FOR CONTROLLING FLOW RATE FROM A VALVE DISPENSER

This invention relates to dispensing apparatus and to a user operated valve assembly for use with a dispensing apparatus. Particularly, but not exclusively it relates to a dispensing apparatus and valve assembly for dispensing viscous materials from a container under pressure of a propellant.

It is known to provide a dispensing apparatus which includes a valve mechanism fitted to a container filled with a product, for example mastic or sealant, which is to be dispensed. An example of such an apparatus is disclosed in WO 01/49585 (Rocep Lusol Holdings Limited). The user presses the handle of a lever to open the valve and dispense product from the pressurised container. In apparatus using a tilt valve the user pushes the valve stem to one side to open the valve and dispense product from the pressurised container. However such dispensers are intended for use only in

situations where a full flow of product is required. There is no intermediate setting of the valve which permits an intermediate flow rate, and it can be difficult to ensure a steady stream of flow unless the valve is fully open.

It is an object of the present invention to provide a dispensing apparatus which overcomes one or more of the above disadvantages.

According to the present invention there is provided a valve assembly for use with a dispensing apparatus, the valve assembly comprising:

a valve;

a lever arranged to open the valve to dispense product; and

variable spacer means arranged to limit the travel of the lever by a variable amount according to the relative position of the lever and the variable spacer means.

According to a first aspect of the present invention the valve is a tilt valve including a valve stem, and the lever is coupled to the valve stem.

Preferably the variable spacer means is adapted to prevent travel of the lever in a particular relative position of the lever and the variable spacer means. In this position the lever cannot be operated so that the valve is effectively locked in a closed position.

Preferably the valve assembly includes a nozzle. Preferably the lever is integral with the nozzle. Preferably the nozzle is sealingly engaged with the valve stem.

Preferably the variable spacer means includes a plurality of spacer portions of differing thickness, each spacer portion being arranged to limit the travel of the lever by a predetermined amount. One spacer portion may be arranged to allow a full range of travel of the lever so that by pressing the lever fully the valve is fully opened. Another spacer portion may be arranged to allow a partial range of travel of the lever so that by pressing the lever fully the valve is opened to an intermediate flow setting. Further spacer portions may be arranged to provide further intermediate flow settings.

Alternatively the variable spacer means may comprise a cam surface arranged to limit the travel of the lever by an amount which varies with the relative position of the lever and the variable spacer means. This allows the user of the valve assembly infinite adjustment of the flow rate by selecting a particular relative position of the lever and the variable spacer means.

In a first preferred embodiment of the first aspect the variable spacer means comprises a collar which in use engages with a container with which the valve assembly is used.

Preferably the spacer portions comprise a plurality of portions of the collar of different height adapted to contact the lever when the lever is at the limit of its travel. Preferably the lever is rotatably mounted relative to the valve so that in use the lever is rotated to select a required limit of travel of the lever and hence a required flow setting of the valve. The collar may be provided with markings to indicate the flow setting associated with each portion of the collar.

Preferably the collar is adapted to press fit on the rolled flange of a standard pressurised container.

In a second preferred embodiment of the first aspect the variable spacer means comprises a collar rotatably mounted around the valve stem beneath the lever.

Preferably the spacer portions comprise a plurality of portions of the collar of different thickness adapted to space the lever from the container with which the valve assembly is used when the lever is at the limit of its travel. Preferably the collar is rotatably mounted relative to the valve so that in use the collar is rotated to select a required limit of travel of the lever and hence a required flow setting of the valve. The collar may be provided with markings to indicate the flow setting associated with each portion of the collar. Alternatively the lever could be rotated relative to the valve and the collar fixed.

Preferably the collar is in the form of a clip having a radial slot. In this way the collar can be readily fixed to a valve stem with a lever already in place.

Preferably the collar is mounted on a portion of the nozzle which extends below the lever. This allows the nozzle, lever and collar to be pre-assembled as a nozzle assembly which can then be snap fitted onto the valve stem of a tilt valve at any stage in the manufacturing process.

Preferably the collar is arranged to engage the rolled flange of a container with which the valve assembly is used when the lever is at the limit of its travel.

In a third preferred embodiment of the first aspect the nozzle serves as the lever. Alternatively the lever is provided between the nozzle and the valve stem and is substantially axially aligned with the valve stem. Preferably the variable spacer means is arranged to limit the lateral travel of the nozzle or lever by a variable amount according to the direction in which the nozzle or lever is displaced.

Preferably the spacer means comprises a collar which in use engages with a container with which the valve assembly is used.

Preferably the variable spacer means comprise a plurality of spacer portions. Preferably the spacer portions comprise a plurality of recessed portions of the collar of different depths adapted to contact the nozzle or lever when the nozzle or lever is displaced towards said recessed portion. Each recessed portion provides a different limit of travel of the nozzle or lever and thus corresponds to a different flow setting of the valve assembly.

Alternatively the variable spacer means may comprise a cam surface of the collar adapted to contact the nozzle or lever when the nozzle or lever is displaced laterally and provide a limit of travel, the limit of travel varying with the direction in which the nozzle or lever is displaced.

The collar may include a sleeve substantially surrounding the valve stem. The collar may be provided with markings to indicate the flow setting associated with each recessed portion.

Preferably the collar is adapted to press fit on the rolled flange of a standard pressurised container.

According to a second aspect of the present invention there is provided a dispensing apparatus comprising a container and a valve assembly according to the first aspect.

Preferably the apparatus comprises means for urging the product from the container. Preferably the

container is pressurised. The container may contain a propellant. The container may contain a piston, situated between the propellant and the valve.

Preferably the valve assembly comprises a mounting cup adapted to secure the valve to the container. Preferably the container is provided with a rolled flange portion and the mounting cup is provided with a corresponding flange portion adapted to engage with the rolled flange portion of the container.

According to a third aspect of the present invention the valve assembly further comprises an actuator which co-operates with a bearing portion of the lever such that operation of the lever from a primed position to a dispensing position causes movement of the actuator to open the valve;
wherein the variable spacer means comprises an adjustable spacing means provided on the lever which can be adjusted to limit the travel of the lever.

Preferably the adjustable spacing means comprises an abutting member which is movable to a selected one of a plurality of positions. Preferably the abutting member is adapted to space the lever from a container with which the valve assembly is used at the limit of travel of the lever.

Preferably the abutting member is arranged such that for each of the plurality of positions of the abutting member there is a corresponding position of the lever at the limit of travel of the lever.

Preferably the lever includes a handle which in use extends along a portion of the side of a container with which the valve assembly is used. Preferably the adjustable spacing means is provided at the handle. Preferably the lever is substantially L-shaped. The angle of the L-shape may be understood to be between approximately 60 degrees and 120 degrees, depending on the shape of the container with which the valve assembly is used. Preferably the bearing portion is provided on a first leg of the L-shape and the handle is provided on the other, second leg of the L-shape.

Preferably the valve assembly includes fixing means for fixing the valve assembly to a container. The fixing means may be a mounting cup.

Preferably the lever is pivotally connected to the valve assembly by a hinge. Preferably the hinge is at the free end of the first leg of the L-shape. The hinge may be provided on a collar secured to the valve. The collar may be secured by the fixing means.

In one embodiment of the third aspect the actuator is provided with a cam surface which co-operates with the lever bearing portion, such that upon rotation of the actuator the lever bearing portion is raised by action of the cam surface.

Preferably the cam surface comprises one or more depressions and one or more raised surfaces.

Preferably the lever has two lever bearing portions arranged at opposite sides of the valve. Preferably the actuator is a ring and the cam surface comprises two depressions arranged at opposite sides of the ring and two raised surfaces arranged between the depressions at opposite sides of the ring.

In a further embodiment of the third aspect the actuator is threadedly engaged with a valve stem of the valve. Preferably the actuator is provided with a bearing surface which co-operates with the lever bearing portion, such that upon rotation of the actuator relative to the valve stem the lever bearing portion is raised by action of the bearing surface.

Preferably the valve assembly includes a nozzle which is rotationally coupled to the actuator. Preferably the actuator comprises a ring member arranged at a lower end of the nozzle. The actuator may be integral with the nozzle.

Preferably the actuator is provided with means to limit the rotational travel of the actuator. These means may comprise two end stops provided on the actuator adapted to locate against an upstand on the valve assembly.

Preferably the valve is a tilt valve. Tilt valves are generally known in dispensing apparatus and operate by tilting of a hollow central stem which is resiliently held on a mounting cup by a rubber grommet. The stem is closed at its lower end by a sealing plate. When the stem is tilted, the seal between the grommet and the sealing plate is broken and the product can reach apertures in the central stem and thence flow along the hollow stem.

Preferably the actuator comprises one or more dog teeth and the hinge assembly comprises one or more slots, adapted such that a dog tooth can enter a slot only when the nozzle assembly is in the open position. The nozzle assembly is preferably coupled to the valve stem for longitudinal movement, such that movement of the nozzle assembly towards the container causes the dog tooth to enter the slot and the valve stem to move, thereby opening the valve to release the product.

According to a fourth aspect of the present invention there is provided a dispensing apparatus comprising a container, a nozzle and a valve assembly arranged between the container and the nozzle, the valve assembly comprising:

a valve;

a lever having a bearing portion; and

an actuator which co-operates with the bearing portion of the lever such that operation of the lever from a primed position to a dispensing

position causes movement of the actuator to open the valve;

wherein the lever comprises an adjustable spacing means which can be adjusted to limit the travel of the lever.

Preferably the adjustable spacing means comprises an abutting member which is movable to a selected one of a plurality of positions. Preferably the abutting member moves by sliding. Preferably the abutting member is adapted to engage resiliently in each of the plurality of positions.

Preferably the lever has a handle portion. Preferably the abutting member is adapted to space the handle portion of the lever from the container at the limit of travel of the lever.

Preferably the abutting member is arranged such that for each of the plurality of positions of the abutting member there is a corresponding position of the handle at the limit of travel of the lever.

Preferably the valve assembly is a valve assembly according to the first aspect of the invention.

Preferably the actuator is provided with a cam surface which co-operates with the lever bearing portion. Preferably the actuator is rotationally coupled to the nozzle.

Preferably the apparatus comprises means for urging the product from the container. Preferably the container is pressurised. The container may contain a propellant. The container may contain a piston, situated between the propellant and the valve.

Preferably the valve comprises a mounting cup adapted to secure the valve to the container. Preferably the container is provided with a rolled flange portion and the mounting cup is provided with a corresponding flange portion adapted to engage with the rolled flange portion of the container.

Specific embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 shows a collar of a valve assembly according to the invention;

Fig. 2 shows a section through a valve assembly including the collar of Fig. 1 with the lever in a primed position and the valve closed;

Fig. 3 shows a section through the valve assembly of Fig. 2 with the collar in an intermediate flow position and the lever at the limit of its travel with the valve opened to an intermediate flow setting;

Fig. 4 shows a section through the valve assembly of Fig. 2 with the collar in a full flow

position and the lever at the limit of its travel with the valve fully open;

Fig. 5 shows a section through another valve assembly according to the invention before attachment of the collar with the lever in a primed position and the valve closed;

Fig. 6 shows a section through the valve assembly of Fig. 5 with the collar attached in an intermediate flow position and the lever at the limit of its travel with the valve opened to an intermediate flow setting;

Fig. 7 shows a section through the valve assembly of Fig. 5 with the collar attached in a full flow position and the lever at the limit of its travel with the valve fully open;

Fig. 8 shows an exploded view of another valve assembly according to the invention;

Fig. 9 shows the valve assembly of Fig. 8 in an assembled state;

Fig. 10 shows a section through the valve assembly of Fig. 8;

Fig. 11 shows a further valve assembly according to the invention;

Fig. 12 is a side elevation on the valve assembly of Fig. 11 with the lever in a parked position;

Fig. 13 is a side elevation on the valve assembly of Fig. 11 with the lever in a primed position;

Figs. 14, 15 and 16 show a perspective view, a longitudinal section and a transverse section respectively of the adjustable spacer of a valve assembly according to the invention; and

Figs. 17 and 18 show the adjustable spacer and the abutting member respectively of another valve assembly according to the invention.

Referring to Figs. 1 to 4 of the accompanying drawings, there is disclosed a valve assembly 10 fitted on a container 12 to form a dispensing apparatus 11. In this example, the container 12 is an aluminium monoblock container of the sort widely used in aerosol applications. It is envisaged that the can 12 could be of tin plate, steel or any conventional can construction having a standard one inch (25 mm) hole in the top. The can may be internally lacquered. However the valve assembly of the present invention can be used with a container 12 of any material holding a pressurised product, for example a container of plastic, glass or metal.

The valve assembly 10 includes a valve 14, a nozzle assembly 16, a lever 18 and a collar 20 secured to the container 12. The valve is a tilt valve of the type widely used in pressurised dispensers and operated by tilting the valve stem 30. The valve stem 30 is a hollow plastic tube with apertures 32 in the tube wall at the lower end. The upper end 34 is open, while the lower end is closed by a plastic sealing disc 36. A resilient grommet 38 of rubber or synthetic material surrounds the lower portion of the stem 30 and is held in place by the sealing disc 36 and a retaining collar 31 formed on the outside of the stem 30.

The grommet 38 is sealed to a mounting cup 44 of metal. The mounting cup has an outer flange 48 which is adapted to fit around a rolled flange 13 which extends around the opening of the container 12. When the stem 30 is tilted, the sealing disc 36 is pushed away from the grommet 38 on one side, and material in the container 12 is free to pass between the sealing disc 36 and grommet 38, through the apertures 32, along the inner bore of the stem 30 and through the open end 34 of the stem. When the stem is released, the resilience of the grommet 38 pushes the stem back to the position shown in Fig 2.

The nozzle assembly 16 includes a nozzle 22 at its upper end. In the example the nozzle 22 is angled, but it may be straight or positioned at a different angle. In the example the lever 18 is integrally formed with the nozzle assembly 16 as a one-piece

plastic moulding, but it may be attached separately. The nozzle assembly sealingly engages at its lower end with the valve stem. This can be by a screw thread or snap fit or any other appropriate engagement means. The nozzle 22 may be provided with a removable nozzle cap (not shown).

The collar 20 is shown in more detail in Fig. 1. The collar 20 is a ring shaped collar formed of moulded plastic and includes a circular groove 50 in its lower face which is adapted to snap fit over the rolled flange 13 of the container and/or the outer flange 48 of the mounting cup 44.

The collar 20 is a variable spacing means and has a number of spacer portions 52, 54, 56, each of different height, arranged about the collar. In use the lever 18 is rotated until it extends over the required spacer portion. The user then depresses the lever until the underside 60 of the lever 18 contacts the top of the spacer portion, at which point the lever 18 is at the limit of its travel. By positioning the lever over a different spacer portion 52, 54, 56 the user selects a different limit of travel and therefore a different flow setting of the valve. Fig 3 shows the lever 18 fully depressed over spacer portion 56, with the valve 14 opened to an intermediate flow setting. Fig 4 shows the lever 18 fully depressed over spacer portion 52, with the valve 14 opened to a fully open flow setting.

To dispense product, a user presses down on the handle 62 of the lever, moving it from the primed position shown in Fig 2 towards the body of the container 12 to adopt the dispensing position shown in Fig 3 or 4. Because there is a predetermined valve position associated with each dispensing position, product is urged to flow, by virtue of the internal pressurisation of the pack, at a constant predetermined rate through the ports 32 and up through the valve stem 30 and out through the nozzle 22.

To stop dispensing, the user simply releases the handle 62. This closes the valve by allowing the valve stem 30 to tilt back to the position shown in Fig 2 and close access through the ports 32.

The collar 20 may include a further spacer portion (not shown) which is higher than the other spacer portions 52, 54, 56 and which extends to the underside 60 of the lever 18. The lever could then be rotated to extend over the higher spacer portion to prevent travel of the lever and effectively lock the valve in a closed position. If required the collar may include a corresponding projection diametrically opposite to prevent the lever being pivoted in the opposite direction when the lever is in the "locked" position.

Figs 5 to 7 show a further embodiment of a valve assembly 10' according to the invention. The container 12, valve 14, nozzle assembly 16 and lever

18 are the same as those described above with reference to Figs 2 to 4, and so are not described further.

In this embodiment the variable spacer means is a ring-shaped collar 80 with a radial slot (not shown) adapted to clip around the shaft of the nozzle assembly 16 beneath the lever 18. In the illustrated embodiment of Figs 6 and 7 the collar has two spacer portions 82, 84, although the number of spacer portions can be varied. In use the lever 18 or collar 80 is rotated until the lever 18 extends over the required spacer portion 82, 84. The user then depresses the lever until the lever 18 urges the spacer portion into contact with the flange 13 of the container 12, at which point the lever 18 is at the limit of its travel. By positioning the lever over a different spacer portion 82, 84 the user selects a different limit of travel and therefore a different flow setting of the valve. Fig 6 shows the lever 18 fully depressed over spacer portion 82, with the valve 14 opened to an intermediate flow setting. Fig 7 shows the lever 18 fully depressed over spacer portion 84, with the valve 14 opened to a fully open flow setting.

Operation is as described for the first embodiment. The collar 80 may include a further spacer portion (not shown) which is deeper than the other spacer portions 82, 84 and which extends over height H as shown in Fig 5 when the lever 18 is in the at-rest position. The lever 18 or collar 80 could then be

rotated to prevent travel of the lever and effectively lock the valve in a closed position. If required the collar 80 may include a corresponding projection diametrically opposite to prevent the lever being pivoted in the opposite direction when the lever is in the "locked" position.

Figs 8 to 10 show a further embodiment of a valve assembly 10" according to the invention. The container 12 and valve 14 are the same as those described above with reference to Figs 2 to 4, and so are not described further.

In this embodiment nozzle assembly 90 acts as a lever, and the product is dispensed by displacing the nozzle assembly 90 laterally. The variable spacer means is a collar 92 which has a top plate 94 and a sleeve 96 which extends down from the top plate to form a flush connection with the wall of the container 12. The collar 92 includes an internal tubular wall 98 which positively engages with the rolled flange 13 which extends around the opening of the container 12.

The top plate 94 of the collar 92 has three recessed portions 100, 102, 104. The recessed portion 100 is the shallowest of the three. When the nozzle assembly 90 is operated in the direction of the shallowest recessed portion 100 the tilt valve 14 can only partially open, so that product flows from the container 12 at a slow flow rate. When the nozzle assembly 90 is operated in the direction of

the middle recessed portion 102 the tilt valve 14 can open to a greater extent, so that product flows from the container 12 at a medium flow rate. When the nozzle assembly 90 is operated in the direction of the deepest recessed portion 104 the tilt valve 14 can open fully, so that product flows from the container 12 at the maximum flow rate.

Markings 106 can be provided on the collar 92 to indicate the flow rate associated with each recessed portion 100, 102, 104. The top plate 94 is provided with a flange 108 of the same diameter as the rolled flange 13 of the container 12, so that a cap 110 adapted to fit on the rolled flange 13 can also fit on the collar 92.

Modifications and improvements may be made to the foregoing without departing from the scope of the invention. In particular the step-like spacer portions 52, 54, 56, 82, 84 or recesses 100, 102, 104 of the illustrated embodiments may be replaced by cam surfaces which allow quasi-infinite adjustment of the maximum travel of the lever. The variable spacer means 20, 80, 92 may have shapes and forms other than those illustrated. The shape and form of the lever 18 and nozzle assembly 90 may be varied. The collar 82, 84 may be rotatably or slidably fixed to the underside 80 of the lever. The spacer portions may be adapted to bear on a part of the container 12 or mounting cap 44 other than the rolled flange 13. The spacer portions 52, 54, 56, 82, 84 may be provided with locating grooves or

other means to encourage engagement with the lever 18 at particular relative rotational positions.

Referring now to Figs. 11 to 13 of the accompanying drawings, there is disclosed another valve assembly 210 according to the invention fitted on a container 212 to form a dispensing apparatus 211. In this example, the container 212 is an aluminium monoblock container of the sort widely used in aerosol applications. It is envisaged that the can 212 could be of tin plate, steel or any conventional can construction having a standard one inch (25 mm) hole in the top. The can may be internally lacquered. However the valve assembly of the present invention can be used with a container 212 of any material holding a pressurised product, for example a container of plastic, glass or metal.

The valve assembly 210 includes a valve (not shown), a hinge collar 216, a lever 218 and an actuator 220 including a nozzle 222 and cap 282. The valve is a tilt valve of the type widely used in pressurised dispensers and operated by tilting the valve stem. The valve assembly, excluding handle 302, is described in WO01/49585 and is not described further here.

When the actuator is in the primed or open position, as in Fig 13, then depression of the handle 302 towards the container 212 causes the bearing portion 300 of the lever 218 to push the actuator 220 in the direction of arrow A towards the hinge assembly 216.

The actuator 220 is linked to the valve stem to prevent relative longitudinal movement of the valve and nozzle 222. The linking means may comprise a thread or a rib and groove arrangement.

To dispense product, a user then presses down on the lever handle 302, moving it from the primed position shown in Fig 13 towards the body of the container 212 to adopt the dispensing position shown in Fig 12.

As seen more clearly in Figs 14 to 16, the handle 302 includes a plate 320, typically of moulded plastic, which may be fixed by snap fit or sliding onto the wires 322 which form the handle. The plate 320 is provided with an adjustable spacing means 324 in the form of an abutting member 326 which is held in a slot 328 in the plate 320. The abutting member 326 has a thumb grip 330 and can slide longitudinally along the handle 302. When the abutting member 326 is in a first position 326' shown in Fig 13, the handle 302 can only move a limited distance towards the container 212 to a first dispensing position, so that the valve is only opened to an intermediate flow position. When the abutting member 326 is in a second position 326'' shown in Fig 13, the handle 302 can move a greater distance towards the container 212 to a second dispensing position, so that the valve is opened to a fully open flow position.

It is to be understood that detent formations may be formed in the abutting member 326 and/or plate 320 so that the adjustable spacing means 324 is readily set at the required dispensing position. If the abutting member 326 is moved to further intermediate positions, then the valve may be opened to further intermediate flow positions. There may be two, three or more intermediate dispensing positions.

The plate 320 and/or thumb grip 330 are provided with markings 332 which indicate the position to which the abutting member 326 must be moved to achieve a particular flow position. The flow position may be set while the lever 218 is in the parked or primed position, so that pressing the handle 302 towards the container 212 from the primed position results in the required flow rate of product. The abutting member 326 effectively spaces the handle 302 from the container 312 at the limit of travel of the lever 218. The abutting member 326 is arranged such that for each of a plurality of positions of the abutting member 326 there is a corresponding position of the lever 218 at the limit of travel of the lever.

When the valve is open product is urged to flow, by virtue of the internal pressurisation of the pack, through the valve stem and out through the nozzle 222.

To stop dispensing, the user simply releases the lever handle 302. This closes the valve by allowing

the valve stem to slide back and close access through the valve.

The abutting member 326 may be of any suitable shape or size which can be positively engaged in the slot. In the example of Figs 14 to 16 the member 326 includes split legs 334 having detent portions 336 to non-removably engage with the slot. Figs 17 and 18 show an alternative form of abutting member 326', which may be engaged by pushing through the thumb grip portion 330' through the slot 328 in the resilient plate 320. However the abutting member may be a simple sliding device slidably mounted on the wire 322 of the handle 302, or a device which slidably engages with the edge of the handle plate 320.

Modifications and improvements may be made to the foregoing without departing from the scope of the invention. In particular the means of coupling vertical movement of the bearing portion 300 of the lever with opening of the valve is not limited to the embodiments described above, and the adjustable spacing means of the valve assembly of the invention may be used with any suitable valve, lever and actuator.